PATENT
134314-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Gary Edward Trewiler et al.	:	
	:	Group Art Unit: 3726
Serial Number: 10/713,493	:	
	:	Examiner: Afzali, Sarang
Filed: November 14, 2003	:	
	:	
For: METHOD FOR REPAIRING GAS TURBINE ROTOR BLADES	:	

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
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APPEAL BRIEF

This is an appeal from the rejection of claims of the claims of the above-referenced patent application made in the Office Action dated May 27, 2009, and made Final. A Notice of Appeal was filed on November 25, 2009.

I. REAL PARTY IN INTEREST

The real party in interest in connection with the instant appeal is General Electric Company, of 1 River Road, Schenectady, New York 12345, a New York corporation, owner of a 100% interest in the instant patent application.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative, or assignee are not aware of any pending appeals or interferences, which may be related to, directly affect or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1, 3, 5, 6, 8-20, and 22 are pending in the instant patent application for consideration. Claims 2, 4, 7, and 21 have previously been canceled. Claims 8-20 have previously been withdrawn from consideration by the Examiner.

Claims 1, 3, 5, 6, and 22 stand finally rejected.

The rejections of Claims 1, 3, 5, 6, and 22 are being appealed. A copy of the claims

involved in the instant appeal appears in Section VIII, the Claims Appendix, of this Brief.

IV. STATUS OF AMENDMENTS

No amendments have been filed after the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following summary correlates claim elements to specific embodiments described in the application specification, but does not in any manner whatsoever limit claim interpretation. Rather, the following summary is provided only to facilitate the Board's understanding of the subject matter of the instant appeal. Specifically, the present invention is defined by the following independent claims as set forth below.

Independent Claim 1 is directed to a method of replacing a portion of a gas turbine engine rotor blade 50. See, e.g., page 2, paragraph [0015]. The rotor blade 50 has an original blade contour defined by a blade first sidewall 70 and a blade second sidewall 72. See, e.g., page 2, paragraphs [0015]-[0016] and FIG. 2. The method includes cutting through the rotor blade 50 such that a cut line 110 extends from a leading edge 74 of the blade 50 to a trailing edge 76 of the blade 50 and between the first sidewall 70 and the second sidewall 72. See, e.g., page 2, paragraph [0020] and FIG. 3. The cut line 110 extends at least partially through a hollow portion of the blade defined between the first and second sidewalls 70 and 72. See, e.g., page 2, paragraphs [0016] and [0020] and FIG. 3. The portion 90 of the rotor blade that is radially outward of the cut line 110 is removed. See, e.g., page 2, paragraphs [0020]-[0021] and FIG. 3. A replacement blade portion 120 that is produced using a substantially similar method as was used to produce the removed portion 90 is provided. See, e.g., page 2, paragraph [0022]. The method includes at least one of forging and casting. Id. With resistance welding, the replacement blade portion 120 is coupled to a remaining blade portion 98 at a joint 152 defined by the cut line 110 using an automated process with a single-pass weld using a welding material 126 that includes at least one of a nickel alloy and a titanium alloy to form a single weld joint 152 extending along the cut line 110 such that a newly formed rotor blade 150 is formed with an aerodynamic contour that is one of an improvement in aerodynamic performance over the original blade contour and mirroring the original blade contour. See, e.g., page 2, paragraphs [0021]-[0022].

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Appellants appeal the rejection of Claims 1, 3, 5, 6, and 22 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement.

B. Appellants appeal the rejection of Claims 1, 3, 5, and 6 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,438,838 issued to Meier et al. (hereinafter Meier) in view of U.S. Patent No. 3,650,635 issued to Wachtell et al. (hereinafter Wachtell) or, in the alternative, as obvious over Meier in view of U.S. Patent No. 6,912,446 issued to Wang et al. (hereinafter Wang) and Wachtell.

C. Appellants appeal the rejection of Claim 22 under 35 U.S.C. § 103(a) as being obvious over Meier in view of Wang and Wachtell, as applied to claim 1, and further in view of U.S. Patent No. 6,238,187 issued to Dulaney et al. (hereinafter referred to as Dulaney).

VII. ARGUMENT

The contentions of the Appellant with respect to the grounds of rejection presented for review, and the basis thereof, with citations of the statutes, regulations, authorities, and parts of the record relied upon are presented herein for consideration by the Board. Details as to why the rejections cannot be sustained are set forth below.

A. Claims 1, 3, 5, 6, and 22 comply with the requirements of 35 U.S.C. § 112, first paragraph

Claims 1, 3, 5, 6, and 22 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

A patent application satisfies the written description requirement when "the description clearly allows persons of ordinary skill in the art to recognize that he or she invented what is claimed." M.P.E.P. § 2163.02 (citing In re Gosteli, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989)). The claim language "need not be described literally (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement." M.P.E.P. § 2163.02. For example, a patent application may disclose an inherent feature even when the feature is not explicitly recited in the specification. See M.P.E.P. § 2163.07(a).

M.P.E.P. § 2163.07(a) recites, for example:

> To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient."

(Quoting In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)).

Appellant respectfully submits that at least paragraph [0022] provides support for "providing a replacement blade portion that is produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting," as is recited in Claim 1. For example, paragraph [0022] of the originally filed specification recites, in part, "Additionally, undamaged portion 120 may be fabricated from a material similar to damaged portion 90 thereby more closely matching the original material, i.e. forged vs. cast."

Appellant respectfully submits that, to produce a replacement blade portion that closely matches an "original material, i.e., forged vs. cast," it is necessarily present, and would be recognized by persons of ordinary skill in the art, that a forged original material be made by forging and a cast original material be made by casting. That is, a forged material cannot be produced using a method other than forging, and a cast material cannot be produced using a method other than casting. As such, to produce a replacement blade portion that closely matches an "original material, i.e., forged vs. cast," the replacement blade must be "produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting," as is recited in Claim 1.

Accordingly, Appellant respectfully submits that Claims 1, 3, 5, 6, and 22 comply with the requirements of Section 112, first paragraph.

B. Claims 1, 3, 5, and 6 are nonobvious in view of and patentable over U.S. Patent No. 6,438,838 issued to Meier et al. (hereinafter Meier) in view of U.S. Patent No. 3,650,635 issued to Wachtell et al. (hereinafter Wachtell) or, in the alternative, Meier in view of U.S. Patent No. 6,912,446 issued to Wang et al. (hereinafter Wang) and Wachtell

Meier describes a method for repairing a vane (5) for a turbine. The repair method includes severing and removing a damaged section (4') of vane (5) along a plane (12) such that a stub (13) is formed. During the repair process, an inductor (16) is coupled to a periphery (15) of stub (13) to heat and soften periphery (15). A replacement vane (20) that corresponds in shape and curvature to stub (13) is aligned with and is then welded to stub (13) in a protective gas atmosphere using high-frequency welding. Specifically, when a high-frequency current is applied to inductor (16), the material of stub (13) and replacement vane (20) melts together to enable replacement vane (20) and stub (13) to be bonded together. Notably, Meier does not describe nor suggest providing a replacement blade portion that is produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting.

Wachtell describes a method for repairing damaged or defective turbine guide vanes (21). A substantially-rectangular, longitudinal section of the vane, including the defect (not shown) is cut from vane (21) and is removed. A substantially-rectangular, longitudinal insert (23) is then welded to vane (21) using either tungsten inert gas welding or electron beam welding to couple replacement insert (23) to remaining vane (21). Insert (23) includes columnar grains that extend along a trailing edge of vane (21) such that grain boundaries are substantially eliminated normal to the edge of the insert (23). Notably, Wachtell does not describe nor suggest providing a replacement blade portion that is produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting.

Wang describes a method for repairing an airfoil (34). A computer (60) generates a numerically-controlled (NC) tool path for use by an NC machine (62) with a tool holder (64) and cutting tool (68). A plate is welded to the surface of a fan blade (8) with a weld material of the same material as the plate and fan blade (8). A displacement-sensing probe (66) scans the shape of fan blade (8), including the weld-repaired airfoil portion (34), and sends the data to computer

(60). An NC tool path is then generated to blend the weld-repaired region smoothly with its adjacent surfaces. Notably, Wang does not describe nor suggest providing a replacement blade portion that is produced using a substantially similar method used to produce the removed portion wherein the method includes at least one of forging and casting.

Claim 1 recites a method of replacing a portion of a gas turbine engine rotor blade, wherein the method comprises "providing a replacement blade portion that is produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting."

Appellants respectfully submit that no combination of Meier and Wachtell or Meier, Wang, and Wachtell describes nor suggests a method of replacing a portion of a gas turbine engine rotor blade as is recited in Claim 1. Specifically, no combination of Meier and Wachtell or Meier, Wang, and Wachtell describes nor suggests providing a replacement blade portion that is produced using a substantially similar method used to produce the removed portion wherein the method includes at least one of forging and casting. Rather, in contrast to the invention, Meier describes coupling cast vanes to forged rotors, Wachtell describes casting vanes and reworking the cast vanes, and Wang describes coupling a plate to a blade and generating a numerically-controlled tool path to blend the weld-repaired region.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted as patentable over Meier in view of Wachtell and Meier in view of Wang and Wachtell.

Claims 3, 5, and 6 depend from independent Claim 1. When the recitations of Claims 3, 5, and 6 are considered in combination with the recitations of Claim 1, Appellants respectfully submit that dependent Claims 3, 5, and 6 likewise are patentable over Meier in view of Wachtell and Meier in view of Wang and Wachtell.

C. Claim 22 is nonobvious in view of and patentable over Meier in view of Wang and Wachtell and further in view of U.S. Patent No. 6,238,187 issued to Dulaney et al. (hereinafter Dulaney)

Meier, Wang, and Wachtell are described above.

Dulaney describes a method for repairing a damaged airfoil. The repair method includes removing (step 24) damaged portions or sections (12 and 16, for example) of an airfoil (10) and replacing (step 26) these portions (12 and 16) with replacement pieces (44 and 46, for example). Replacement pieces (44 and 46) are integrally joined to airfoil (10) using a joining (step 28) operation to form a refurbished airfoil that includes a seam (78) defined between airfoil (10) and the replacement piece (44 and 46). The refurbished airfoil is then shaped (step 29) by removing the excess material from replacement piece (44 and 46) and seam (78) to return the joined airfoil to predetermined dimensional tolerances. A laser shock peening treatment (step 30) induces the formation of compressive residual stresses at the seam (78). Notably, Dulaney does not describe nor suggest providing a replacement blade portion that is produced using a substantially similar method used to produce the removed portion wherein the method includes at least one of forging and casting.

Claim 22 depends from independent Claim 1, which is recited above.

Appellants respectfully submit that no combination of Meier, Wachtell, Wang, and Dulaney describes nor suggests a method of replacing a portion of a gas turbine engine rotor blade as is recited in Claim 1.

Specifically, no combination of Meier, Wachtell, Wang, and Dulaney describes nor suggests providing a replacement blade portion that is produced using a substantially similar method used to produce the removed portion wherein the method includes at least one of forging and casting. Rather, in contrast to the invention, Meier describes coupling cast vanes to forged rotors, Wachtell describes casting vanes and reworking the cast vanes, Wang describes coupling a plate to a blade and generating a numerically-controlled tool path to blend the weld-repaired region, and Dulaney describes coupling a replacement piece to an airfoil by securing the joined airfoil in a rigid machine tooling for shaping and laser shock peening.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted as patentable over Meier in view of Wang and Wachtell and further in view of Dulaney.

When the recitations of Claim 22 are considered in combination with the recitations of Claim 1, Appellants respectfully submit that dependent Claim 22 likewise is patentable over

Meier in view of Wang and Wachtell and further in view of Dulaney.

CONCLUSION

For at least the reasons set forth above, Appellants respectfully request that the Office's rejections be reversed and that Claims 1, 3, 5, 6, and 22 be allowed.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

1. A method of replacing a portion of a gas turbine engine rotor blade, the rotor blade having an original blade contour defined by a blade first sidewall and a blade second sidewall, said method comprising:

cutting through the rotor blade such that a cut line extends from a leading edge of the blade to a trailing edge of the blade and between the first sidewall and the second sidewall, such that the cut line extends at least partially through a hollow portion of the blade defined between the first and second sidewalls;

removing the portion of the rotor blade that is radially outward of the cut line;

providing a replacement blade portion that is produced using a substantially similar method as was used to produce the removed portion wherein the method includes at least one of forging and casting; and

coupling, with resistance welding, the replacement blade portion to a remaining blade portion at a joint defined by the cut line using an automated process with a single-pass weld using a welding material that includes at least one of a nickel alloy and a titanium alloy to form a single weld joint extending along the cut line such that a newly formed rotor blade is formed with an aerodynamic contour that is one of an improvement in aerodynamic performance over the original blade contour and mirroring the original blade contour.

3. A method in accordance with Claim 1 further comprising machining the weld to a desired finished dimension.

5. A method in accordance with Claim 1 wherein coupling the replacement blade portion further comprises coupling the replacement blade portion to the remaining blade portion such that the replacement blade portion and the remaining blade portion are fabricated from a substantially similar material including at least one of a nickel alloy, a titanium alloy, and an iron alloy.

6. A method in accordance with Claim 1 wherein cutting through the rotor blade comprises cutting through at least one of a compressor rotor blade and a turbine rotor blade.

22. A method in accordance with Claim 1 further comprising:

rough blending the welded replacement portion; and

final blending the welded replacement blade portion.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.